

REMARKS

Reconsideration of the application is respectfully requested.

I. Status of the Claims

Claims 1-5 and 7 are pending in the application.

Claim 6 is cancelled herein without prejudice or disclaimer.

Claims 1 and 7 are amended. No new matter is added.

II. Claim rejection-35 U.S.C. §103

The rejection of claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida *et al.*, (U.S. Patent No. 5,854,847) in view of Thigpen (Pub. No. 2004/0109575) is traversed.

Applicant's invention is directed to a speaker apparatus for use in an automobile where the speaker apparatus comprises an L channel cone type speaker, an R channel cone type speaker, and a center cone type speaker placed between and in close proximity to the L channel speaker and the R channel speaker. The center speaker produces a –L channel signal (a signal having a reverse or opposite phase) and a –R channel signal (a signal having a reverse or opposite phase). The center speaker is mounted forward of a driver and passenger seat and is placed in the center of the width direction of the automobile. The L channel speaker and the R channel speaker are placed on either side of the center speaker and in close proximity to the center speaker. Each speaker is a cone type speaker.

The vibration axis of the L channel speaker, in the horizontal direction is in a counterclockwise direction from the direction of motion of the automobile and the vertical

axis is at a prescribed angle inclined in the direction of motion of the automobile to intersect with and reflect sound from the front glass.

The vibration axis of the R channel speaker, in the horizontal direction is in a clockwise from the direction of motion of the automobile and in the vertical axis is at a prescribed angle inclined in the direction of motion of the automobile to intersects and reflect sound from the front glass.

The horizontal vibration axis of the center speaker is parallel to the direction of motion of the automobile and in the vertical direction it intersects with the front glass of the automobile.

Referring to Figures 3 and 4 in the application, the left and right cone type speakers are each oriented in at prescribed angles in both the vertical and horizontal axes. In one embodiment, the right speaker is set to have a horizontal vibration axis which is set at an angle of 48 degrees clockwise in the direction of motion of the automobile, and a vertical vibration axis of 65 degrees from the vertical axis toward the front of the automobile. The left speaker is set to have a horizontal vibration axis which is set at an angle of 48 degrees counterclockwise in the direction of motion of the automobile, and a vertical vibration axis of 65 degrees from the vertical axis toward the front of the automobile. Thus, each speaker is oriented in two direction, one direction being relative to the vertical plane and the other being relative to the horizontal plane.

Referring to Fig. 5 in the application, L channel speaker radiates left channel sound and R channel speaker radiates right channel sound. The center speaker radiates a signal having a reverse phase of the L (left) channel speaker and a reverse phase of the R (right)

channel speaker. In the application the reverse phase is designated by a minus sign.

The left channel reverse phase signal (the minus L signal) from the center speaker cancels out more of the L channel signal at the right ear of a person sitting in the left seat of an automobile than at the left ear of that person. Thus, there is a difference in signal levels in the areas near the right and left ears of the person in the left seat of the automobile. As a result, the sound image of the L channel is identified as being near the front left side of the person in the left seat. A similar result is obtained with the person in the right seat of the automobile. The art of record neither discloses nor suggests doing what is disclosed in the application and now positively recited in claim 1..

Yoshida discloses an automobile having two side speakers and a central speaker where a delay circuit is coupled to the side speakers so that the sound signals emitted from each side speaker is delayed relative to the sound from the central speaker. In this way the sound from the central speaker is emitted at an earlier time than the sound signals from the side speakers. Referring to Yoshida, col. 4, lines 12-22, "...as a result, for the listeners it seems as if the two side speakers are disposed further away than the central speaker...(and)...for the listeners it seems as if there is only one sound source." (underscoring added). Thus, with Yoshida, the result is that the listener believes that the sound source is coming only from the front of the automobile (*see* Col. 4, lines 19-22).

In Applicants' invention, however, the sound is not delayed. It is generated from each speaker at the same time. Yoshida does not disclose speakers having a specific vertical axis or a specific horizontal axis. Yoshida discloses, in Fig. 2, three speakers mounted in the dash of an automobile. A description as to the orientation of the speakers in the automobile is

absent in the description.

In Yoshida, the speakers are located next to the front doors of the automobile. They are neither tilted relative to the vertical axes nor positioned close to each other.

Claim 1 now recites that the

... L channel cone type speaker unit placed forward of a driver seat and a passenger seat of the automobile and immediately at the left of the center speaker having:

a horizontal vibration axis in a direction pivoted counterclockwise from a forward direction of motion of said automobile, and

a vertical vibration axis directed at an incline of a prescribed angle in the direction of motion of said automobile to intersect with and direct sound from a front glass of an automobile...

in combination with

...an R channel cone type speaker unit placed forward of the driver seat and the passenger seat of the automobile and immediately at the right of the center speaker having:

a horizontal vibration axis in a direction pivoted clockwise from the forward direction of motion of said automobile, and

a vertical vibration axis at an incline of a prescribed angle in the direction of motion of said automobile to intersect with and direct sound from a front glass of said automobile.

Yoshida neither discloses nor suggests the structure of left and right speakers located immediately to the left and right of the center speaker and where the left and right speakers are each oriented to have a horizontal vibration axes which is at an angle to the horizontal plane and a vertical vibration axes which is at an angle to the vertical plane as is now recited

in claim 1.

The Examiner states that Yoshida does not disclose a vertical axis at an incline of a prescribed angle in the direction of motion of said automobile to intersect with and direct sound from a front glass of the automobile. The Examiner then states that Thigpen discloses a vertical vibration axis at an incline of a prescribed angle in the direction of motion of said automobile to intersect with and direct sound from a front glass of said automobile (Figs. 1, 2 and 9 and paragraph 26, lines 1-6). Thigpen discloses directional acoustic transducers as speakers. He does not disclose cone type speakers. Actually, Thigpen teaches that sound from a conventional cone type speaker which is reflected will sometimes result in a comb filtered frequency response curve to cause the cancellation of some frequencies. See paragraph [0027]. Thigpen states in the last sentence of paragraph [0027] that “With the present invention, most of the sound energy arrives from the reflective surface and at the same time, thus reducing comb filtering.” Thus, Thigpen teaches that sound from a cone type speaker which is reflected from glass will result in poor sound quality because some of the frequencies will be cancelled. Referring now to paragraph [0033], Thigpen clearly states that “A conventional cone type speaker ...will not project a convincing acoustic image onto the glass because of the wide dispersion associated therewith”. Clearly, Thigpen teaches that poor quality sound will result when sound from a cone type speaker is reflected from glass. Therefore, Thigpen teaches away from doing what Applicants are doing and claim as their invention, that of positioning a cone type speaker to reflect sound from the front glass of the automobile. Also, nowhere does Thigpen disclose or even suggest that his transducer is tilted relative to the vertical plane. It is only after the Examiner has read and understood Applicants

invention that he has twisted the teaching of Thigpen to do what Thigpen strongly indicates will not provide high quality sound with cone type speakers in his attempt to anticipate what Applicants now recite in Claim 1.

In addition, in Thigpen, the acoustic transducers are positioned to be flat, not at an angle as Applicants disclose and claim. *See* paragraph [0029] where Thigpen states that the rectangular planar magnetic speakers are placed across the dash in end-to-end relationship with the long axes thereof oriented perpendicular to the vehicle front listening position. In paragraph [0030], Thigpen states that best separation will be obtained by positioning the transducers perpendicular to the listener. Thus, Thigpen teaches away from reflecting sound from a cone type speaker off glass and tilting the speakers as Applicants disclose and positively recite in claim 1.

Claim 1 now recites the structure of

A speaker apparatus for mounting in an automobile, comprising:

a center cone type speaker located in the center of the width direction of the automobile

an L channel cone type speaker unit placed forward of a driver seat and a passenger seat of the automobile and immediately at the left of the center speaker having:

a horizontal vibration axis ~~is~~ in a direction pivoted counterclockwise from a forward direction of motion of said automobile, and

a vertical vibration axis directed at an incline of a prescribed angle in the direction of motion of said automobile to intersect with and direct sound from a front glass of an automobile;

an R channel cone type speaker unit placed forward of the driver seat and the passenger seat of the automobile and immediately at the right of the center speaker having:

a horizontal vibration axis in a direction pivoted clockwise from the forward direction of motion of said automobile, and

a vertical vibration axis at an incline of a prescribed angle in the direction of motion of said automobile to intersect with and direct sound from a front glass of said automobile.

As noted above, neither Yoshida nor Thigpen, either separately or combined disclose or suggest doing what Applicants disclose and now claim, that of having three cone type speakers positioned near to each other where the left and right cone type speakers are each inclined at two prescribed angles, one being relative to the vertical plane and the other being angled relative to the horizontal plane. For the reasons noted above, claim 1 clearly avoids the references cited and is believed to be in condition for allowance.

II. Claim rejection-35 U.S.C. §103

The rejection of claims 2-3 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida *et al.*, (U.S. Patent No. 5,854,847) in view of Thigpen (Pub. No. 2004/0109575) in further view of Yajima *et al.*, (U.S. Patent No. 6,519,344) is traversed.

Claims 2-3 and 5 depend from claim 1 and, therefore, are considered to be in condition for allowance.

III. Claim rejection-35 U.S.C. §103

The rejection of claim 4 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida *et al.*, (U.S. Patent No. 5,854,847) in view of Thigpen (Pub. No. 2004/0109575) in further view of Yajima *et al.*, (U.S. Patent No. 6,519,344) in further view of Goldfarb (U.S. Patent No. 5,764,777) is traversed.

Claim 4 depends from claim 1 and therefore, is considered to be in condition for allowance.

IV. Claim rejection-35 U.S.C. §103

The rejection of claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida *et al.*, (U.S. Patent No. 5,854,847) in view of Yajima *et al.*, (U.S. Patent No. 6,519,344) is noted. Claim 6 is cancelled.

V. Claim rejection-35 U.S.C. §103

The rejection of claim 7 under 35 U.S.C. § 103(a) as being unpatentable over Yoshida *et al.*, (U.S. Patent No. 5,854,847) in view of Yajima *et al.*, (U.S. Patent No. 6,519,344) in further view of Thigpen (Pub. No. 20040109575) is traversed. Claim 7 is amended to now recite the structure of claim 6 in combination with the features of claim 1. For the reasons noted above about claim 1, claim 7 also avoids the references applied. Therefore, it is our understanding that claim 7 is in condition for allowance.

Each and every point raised in the Office Action has been addressed on the basis of the above amendments and remarks. In view of the above, each of the presently pending claims in this application is believed to be in condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

The Examiner is respectfully requested to contact the undersigned at the telephone number indicated below if the Examiner believes any issue can be resolved through either a Supplemental Response or an Examiner's Amendment.

Respectfully submitted,

By

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